

RESULTS OF TRIAL TEST BURNS ON ARMY  
DEACTIVATION FURNACES UPGRADED TO MEET RCRA

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Presented at the  
25TH DoD EXPLOSIVES SAFETY SEMINAR  
ANAHEIM HILTON HOTEL, ANAHEIM, CA  
18-20 AUGUST 1992

ABSTRACT

In 1987 the Department of Army started the process of upgrading the Ammunition Peculiar Equipment (APE) 1236 Deactivation Furnace to meet the regulatory requirements of the Resource Conservation and Recovery Act (RCRA). The furnace is used to dispose of class 1.1, 1.2, 1.3 and 1.4 munitions which are classified as hazardous waste. The upgrade has been ongoing nationwide for the past four years. This paper presents data from three trial burns which have occurred and information on the status of Part B permits for the upgraded sites.

INTRODUCTION

A Part B permit is required under RCRA for the operation of hazardous waste incinerators. The Army has been involved in upgrading facilities and performing trial burns to obtain part B permits for the furnace operations. A paper presented at the 24th DoD Explosive Safety Seminar in 1990 introduced the project and detailed the equipment upgrades required by these facilities to meet RCRA standards. Most of the facilities being upgraded have the hardware installed to operate within RCRA. The remaining hurdle to be cleared is completing the trial burn and obtaining a Part B Permit.

BACKGROUND

Nineteen sites were originally selected to be upgraded to comply with RCRA. Of the sites, three have been deleted. Installation of equipment is complete at ten sites and the remaining six sites are either underway or being reevaluated. Of the upgraded sites, three (Kansas, Lake City and Iowa Army Ammunition Plants) had their Part B permit application submitted and a draft permit approved prior to Nov of 1988. Tooele Army Depot and Anniston Army Depot both had permits submitted but did not have an approval draft. The remaining sites did not have a Part B permit application submitted for review. Today, only the original three sites have a Part B permit in place or pending.

Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE <b>AUG 1992</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-1992 to 00-00-1992</b>	
4. TITLE AND SUBTITLE <b>Results of Trial Test Burns on Army Deactivation Furnaces Upgraded to Meet RCRA</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Ammunition Equipment Directorate, Tooele Army Depot, Tooele, UT, 84074</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES <b>See also ADA260984, Volume I. Minutes of the Twenty-Fifth Explosives Safety Seminar Held in Anaheim, CA on 18-20 August 1992.</b>					
14. ABSTRACT <b>see report</b>					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>16</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

## PROJECT STATUS

The original project required installation of equipment and controls costing approximately \$1M per site. Several sites were deleted in the early stages of the project due to cost and/or being on the base closure list. The remaining sites have been proceeding for nearly four years to obtain a Part B Permit. The actual installation of hardware is nearly complete with only six sites remaining to be done. These sites are on schedule and should be complete within two years.

The Part B Permits for Iowa, Lake City and Kansas were submitted early and a draft permit approved. Tooele and Anniston are both near approval on their draft permit, but in both cases it has been a lengthy difficult process. Seven sites submitted their permits in 1991 and are either awaiting review by the State or are in the process of answering Notices of Deficiency. With the exception of the three AAP sites there is no current accurate estimate on when any site will actually receive a draft permit or be allowed to proceed with a trial burn.

Trial burns have been performed at Lake City AAP and Iowa AAP. The trial burn for Kansas is scheduled for early 1993. Lake City completed their trial burn and has an approved Part B permit to operate their furnace. Iowa has approximately six more hours of burn time to complete the required data collection for final submission to the state. Tooele performed a mini-burn in 1988 and the results of that burn are also included in the report.

The original permits for the other seven sites were prepared under contract to the Corps of Engineers, Huntsville Division. There have been significant additions to most of the original permit applications due either to requests for more information by the states or due to changing regulatory requirements.

The Army Environmental Hygiene Agency (AEHA) prepared a model trial burn plan which has been used in the permit applications. Experience indicates that this has been a good starting point. Most permits have required modifications to the original trial burn plan and to other sections to answer concerns of the regulators. This has been a difficult, lengthy effort with no immediate relief in sight. Heightened concern about public comment and increased awareness of possible hazards have caused the regulators to take a very cautious approach to approval of draft permits.

Part B Permits are based on emissions to the atmosphere. Permit limits are based on either total allowable emissions, percent emissions, or hazards to the surrounding community. Modifications to the original permits were often driven by the regulator's desire to ensure a high probability of success during the trial burn.

Since there are no real-time particulate or metals monitors either currently available or of a high level of dependability, the permits control feed, operating parameters and monitor CO and O<sub>2</sub> out of the stack to ensure compliance.

Many sites felt they had good relations with the state agencies and could obtain draft approval within a few months of submission of the permit. This has proved to be inaccurate. The average time for approval of permits is approaching 3-4 years and with an increased number of applications and regulatory requirements this may get worse.

Of the sites which have made significant progress on permit approval, the trial burn plans have become a key issue in assuring the regulators that the site meets emission standards. Because of this concern the trial burn plans have received close scrutiny and are representative of worst case feed stock to the APE 1236 furnace.

The approved trial burns have been based on a selection of materials which would represent the worst case for different items of concern. The items selected have been considered to represent worst case for particulate metals, principle organic hazard constituents, and chlorine.

(See Table Summary of Trial Burn)

### CONCLUSIONS

APE 1236 furnaces can meet RCRA standards for burning of munitions. The sites have demonstrated that compliance with current standards for POHC, particulate, and metals and chlorine can be achieved by the upgraded facility.

The permitting process itself is the real problem. The time needed to assemble and submit a permit is very lengthy often in excess of a year. This is just the beginning. It can take 3-4 years after the original submission to answer all the notices of deficiency.

Several sites have gotten into an escalating situation where answers to NODs cause new questions requiring more information again raising new questions. The circle must be broken if these sites are to complete the permitting process and get back to work. Only two sites have actually processed munitions since November 1988.

This whole procedure requires streamlining technology and compliance with the standards is not the issue. As shown by the data presented the system can meet the current standards and technology and can keep pace with increasingly stringent regulations. This is being delayed by the permitting process. Meanwhile the ability of the Army to dispose of munitions is being severely impacted.

Table 1. FEED DATA AND OPERATING PARAMETERS

Feed Item	20mm M96	FA-956	HI-SKOR 700x	IMR 5010
Waste Feed Rate (lbs/hr)	543.68	123.80	40.47	181.94
PEP Feed Rate (lbs/hr)	86.80 (est.)	15.91	40.47	181.94
Kiln Rotation (rpm)	1.03	1.67	2.8	2.8
Avg. Kiln Outlet Temp. (deg F)	939	744	696	707
Avg. Afterburner Outlet Temp. (deg F)	1400	1350	1449	1400
Avg. Stack Gas Flow Rate (acfm)	5142	5127	5201	5192

Table 2.

## DRE DATA

Feed Item	20mm M96	FA-956	HI-SKOR 700x	IMR 5010
NG DRE (%)	-	-	99.998	-
DNT DRE (%)	-	-	-	99.9985
DPA DRE (%)	-	-	-	99.9937

Table 3.

## EMISSIONS DATA

Feed Item	20mm M96	FA-956	HI-SKOR 700x	IMR 5010
Avg. Part. Conc. (gr/dscf)	.0160	.0186	.0206	.285
Corrected CO 1 Hour Rolling Avg. (ppm)	20.42	11.07	5.32	23.42
Avg. O2 (%)	15.84	16.83	16.35	16.45

Table 4. METALS DATA (lbs/hr)

Feed Item	20mm M96	FA-956
Avg. Ag	$7.02 \times 10^{-5}$	$5.65 \times 10^{-5}$
Avg. As	$2.82 \times 10^{-5}$	$2.77 \times 10^{-5}$
Avg. Ba	$1.64 \times 10^{-3}$	$1.03 \times 10^{-3}$
Avg. Be	$5.58 \times 10^{-6}$	$5.59 \times 10^{-6}$
Avg. Cd	$1.24 \times 10^{-4}$	$1.23 \times 10^{-4}$
Avg. Cr	$2.45 \times 10^{-4}$	$6.39 \times 10^{-5}$
Avg. Hg	$3.64 \times 10^{-5}$	$4.68 \times 10^{-5}$
Avg. Pb	$6.92 \times 10^{-3}$	$6.13 \times 10^{-3}$
Avg. Sb	$7.04 \times 10^{-4}$	$7.44 \times 10^{-4}$
Avg. Tl	$5.58 \times 10^{-6}$	$5.59 \times 10^{-6}$

Summary: The particulate and DRE standards were met for all tests. Tier II Cr limits were exceeded for two runs of the 20mm. The CO level for all runs were below the Tier I level.

Table 5. FEED DATA AND OPERATING PARAMETERS

Feed Item	20 mm M96	M1 Prop.	M7 Prop.	M1/HCB/METALS
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Kiln Rotation (rpm)	2 rpm for all runs			
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Avg. Afterburner Outlet Temp. (Deg F)	1202 for all runs			
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Table 6.

## DRE DATA

Feed Item	20 mm M96	M1 Prop.	M7 Prop.	M1/HCB/METALS
NG DRE (%)	-	99.998	-	-
DNT DRE (%)	-	-	99.998	-
HCB DRE (%)	-	-	-	97.27

Table 7. EMISSIONS DATA

Feed Item	20 mm M96	M1 Prop.	M7 Prop.	M1/HCB/METALS
Avg. Part. Conc. (gr/dscf)	.0.145	.044	.038	.036
Corrected CO 1 Hour Rolling Avg.	Low of 53.8 ppm to high of 333.9 ppm			
Avg. O2 (%)	16.52 - 16.53 for all runs			

Table 8. METALS DATA

Feed Item	Ml/HCB/METALS (lbs/hr)
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Avg. Cr	$4.95 \times 10^{-5}$
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Avg. Pb	$15.90 \times 10^{-3}$
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Avg. Sb	$0.90 \times 10^{-3}$
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Table 9. HCL DATA

Feed Item	M1/HCB/METALS
Feed Rate	5.85 lbs/hr HCB
Emissions	1.06 lbs/hr HCL

This equates to 24.5% of chloride emitted to atmosphere as HCL. It is estimated that 16.5 lbs/hr of chloride could be fed without exceeding HCL Tier I emissions rates.

Summary: The incinerator had no trouble meeting the DRE for NG and DNT at 1200 Degrees F but did not achieve the DRE for HCB at that temperature. The temperature should be raised to 1400 degrees F to test with HCB for DRE. At the feed rates used during this assessment the Cr and Pb levels were exceeded. The bags in the baghouse did not appear to be properly coated and should be caked more thoroughly for further tests. The chloride being fed at this rate is well below the RCRA Tier I standards for emissions.

Table 10. FEED DATA AND OPERATING PARAMETERS

Feed Item	TNT	PDX 0280	Comp H-6
Waste Feed Rate (lbs/hr)	497	489	356
PEP Feed Rate (lbs/hr)	198.83	199.66	270.91
Kiln Rotation (rpm)	1.03	1.67	2.8
Avg. Kiln Outlet Temp. (deg F)	793	548	593
Avg. Afterburner Outlet Temp. (deg F)	1445	1411	1413
Avg. Stack Gas Flow Rate (acfm)	2399	2795	2373

Table 11. DRE DATA

Feed Item	TNT	PDX 0280
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DRE(%)	99.9985	99.9999
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Table 12. EMISSIONS DATA

Feed Item	TNT	PDX 0280	Comp H-6
Avg. Part. Conc. (gr/dscf)	.0054	.00448	.0121
Corrected CO 1 Hour Rolling Avg.	53	8.3	7.7
Avg. O2 (%)	16.68	17.67	17.64

Table 13. METALS DATA (lbs/hr)

Feed Item	TNT	PDX 0280	Comp H-6
Avg. Cr	$2.64 \times 10^{-6}$	$7.46 \times 10^{-6}$	$5.27 \times 10^{-6}$

Summary: The particulate emission were well below the RCRA standard. DRE for all runs of TNT and RDX exceeded the RCRA standard. The corrected CO value for PBX and Comp H-6 were below the tier I level. Two of the runs for TNT were above the Tier I level. This was probably due to an afterburner flame out during the TNT run.